Guidelines
for
Inspection of Existing Dams

New Jersey
Department of Environmental Protection
Dam Safety
Trenton, NJ 08625

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Guide for the Inspection and Preparation of a Report on the Condition of a Dam

New Jersey Dam Safety Inspection Program

State law relating to the construction, repair, modification, and inspection of existing and proposed dams has been in existence since 1912. The law was amended in 1981 and cited as the Safe Dam Act, N.J.S.A. 58:4-1 et seq. The Dam Safety Standards N.J.A.C. 7:20-1 et seq. were promulgated in May, 1985 and have been readopted with minor modifications in May, 1990 and in May, 1995.

The New Jersey Dam Safety Program is implemented by the Department of Environmental Protection, Division of Engineering and Construction, Dam Safety Section. The objective of the program is to protect lives and property from the consequences of a dam failure or the improper release of impounded water. A primary means of achieving this goal is through the maintenance and periodic inspection of in-service dams.

The New Jersey Dam Safety inspection program is intended to identify conditions that may adversely affect the safety and functionality of a dam and its appurtenant structures; to note the extent of deterioration as a basis for long term planning, periodic maintenance or immediate repair; to evaluate conformity with current design and construction practices; and to determine the appropriateness of the existing hazard classification. The professional engineer performing the inspection should, where appropriate, recommend subsequent investigations required to resolve uncertain conditions and corrective measures to enable the dam to continue to perform its intended functions.

Inspection Guidelines

The New Jersey Dam Safety inspection guidelines are designed to assist the dam owner to better understand the requirements, responsibilities, and duties inherent with dam ownership and to assist the professional engineer by providing a consistent approach to dam inspection and in-service evaluation.

Several different types of dam inspections can be performed. Dams and appurtenances should be inspected regularly to identify conditions that may adversely affect the safety of a dam and its ability to perform intended functions. An inspection may include the periodic evaluation of the as-built dam to insure conformity with current design and construction practices.

Dam Classifications

The State of New Jersey recognizes four (4) classes of dams. Class I dams are those structures which, should they fail, would likely cause loss of life. Class II dams are structures which, should they fail, would likely cause substantial downstream property damage but are not considered to be a threat to life. Class III dams are structures which would cause little or no downstream damage should they fail. Class IV dams are structures which are less than 15 feet in height, impound less than 15 acre feet of water to the top of dam, and drain less than 150 acres. No dam may be included in the Class IV category if failure of the dam could cause downstream property damage or loss of life.

When Should Dams be Inspected

Class I and Class II dam owners are required to have a regular inspection performed every two years and a formal inspection performed every six or ten years respectively. Class III and Class IV dam owners are required to have a regular inspection performed every four years but are not normally required to perform periodic formal inspections. On those years a formal inspection is performed, a regular inspection will not be required. All dams over 70 feet in height or which can potentially store more than 10,000 acre feet of water, regardless of hazard classification, are required to be inspected every year with a formal inspection conducted every third year. All dam inspections shall be performed from March through December.

Types of Inspections

Formal Inspection - The inspection and performance evaluation of Class I and Class II dams under the supervision of a qualified, New Jersey licensed professional engineer to review and determine the safety and integrity of the dam and appurtenant structures. Formal inspections require a detailed field examination and should include a thorough review of the records on project design, construction, and performance. Where appropriate, a reanalysis employing advanced methods and modern design criteria and practices should be conducted in order to determine if the structure meets current design criteria. In addition, formal inspections require that the long-term behavioral patterns revealed by instrumentation and spillway discharges be closely examined. Detailed underwater inspections should be included as needed. A Department approved Emergency Action Plan and Operation and Maintenance Manual should be confirmed and their adequacy determined. Technical experts and specialists may be required to evaluate individual features and conditions; however, a qualified New Jersey licensed professional engineer must make the final coordinated evaluation. A review of prior regular and formal inspection reports should be undertaken to evaluate trends in performance.

Regular Inspection - The visual inspection of a dam by a qualified, New Jersey licensed professional engineer to detect any signs of deterioration in material, developing weaknesses or unsafe hydraulic or structural behavior. For Class I and Class II dams, a Department approved Emergency Action Plan should be confirmed and its adequacy determined. For all dams a Department approved Operation and Maintenance Manual should be confirmed and its adequacy determined. All instrumentation data should be reviewed and evaluated.

Informal Inspection - The visual inspection of the dam by the dam owner or operator to detect apparent signs of deterioration or other deficiencies of the dam structure or function. Informal inspections require that personnel conducting the inspection be knowledgeable about the dam and its appurtenances.

Emergency Inspection - An emergency inspection is an unscheduled inspection of a dam and its appurtenances necessitated by a potentially adverse natural event such as a large flood, earthquake, landslide or when a condition develops that appears to immediately threaten the safety of the dam. An emergency inspection is applicable to any hazard classification and requires immediate attention. Any required emergency repairs resulting from the emergency inspection should be conducted in compliance with N.J.A.C. 7:20 - 1.4 (i).

Inspection Reports and Qualifications of Inspection Personnel

Formal and regular dam inspections must be performed by a qualified, professional engineer. The term

Aqualified engineer,@ as used in these standard guidelines is intended to mean an individual who:

1. Is a licensed New Jersey professional engineer.

2. Is competent in items related to dam investigation, design, construction, and operation for the type of dam being inspected.

3. Has at least 10 years of relevant experience in dam investigation, design, construction, operation, and evaluation.

4. Understands the effects of adverse dam incidents and failures and the potential cause of failures.

The text of the report on the condition of a dam should be concise and provide all relevant dam and dam related facts, findings, conclusions, analysis, recommendations, and data. In addition, each report should contain clear, color photographs with each photograph indicating the date it was taken, the State dam reference number, and the photograph location. The visual inspection checklist, provided by the Department, should be completed and accompany all inspection reports. At the discretion of the Department, a completed visual inspection checklist, together with relevant color photographs, will be considered the minimum information required for an acceptable inspection report.

Inspection reports for Class I, Class II and Class III dams should be submitted to the Department within 30 days of the completion of the inspection. Reports for Class IV dams are to be submitted to the county and/or municipality which has jurisdiction over the dam structure.

Informal inspections may be performed by the dam owner or operator and the resulting inspection report shall be part of the owner=s or operator=s permanent file. Unless specifically requested, informal inspection reports are not to be submitted to the Department. The Department may require the owner or operator of any dam to perform an inspection of any type at any time.

VISUAL INSPECTION CHECKLIST

This general checklist should be used as an aid when examining all dams. This checklist may not, however, include all features or conditions found at a specific dam that are revelant to the safety of that dam. All features integral to the safety of the dam being examined should be inspected and their condition reported.

NJ INSPECTION YEAR:

TYPE OF INSPECTION: (formal, regular, informal):

DAM NAME:

DAM FILE NO.:

LOCATION:

OWNER:

OPERATOR:

DATE OF INSPECTION:

RESERVOIR INFORMATION

Normal Reservoir Elevation (ft):

Reservoir Elevation at time of inspection (ft):

WEATHER CONDITIONS (including recent rainfall):

INSPECTION PERSONNEL

New Jersey Licensed Professional Engineer(s):

Name	Affiliation	Area of Expertise

Non-Licensed technical expert(s) and advisor(s):

Name	Affiliation	Area of Expertise

State Representative(s):

Name	Affiliation

Dam Owner Representative(s):

Name	Affiliation

Others:

Name Affiliation

GENERAL INFORMATION

Name of Dam:

Fed. I.D. No. N.J. Dam No.:

River Basin:

Town: County:

Block: Lot:

Nearest Downstream City-Town:

Stream Name: Tributary of:

Latitude (N): Longitude (W):

Type of Dam:

Purpose of Dam:

Hazard Category: Drainage Area (sqr mls):

Height (ft): Length (ft):

Normal Surface (ac): Normal Capacity (af):

Maximum Capacity (af): Spillway Capacity (cfs):

HISTORY

Date Constructed: Dates(s) Reconstructed:

Designer: Constructed By:

Owner & Address:

Owner/Operator present during inspection (yes or no):

PREVIOUS INSPECTIONS (date of)

Last Inspection: Last Regular Inspection:

Phase I Inspection: Last Formal Inspection:

EMERGENCY ACTION PLAN (Required for all Class I and Class II dams)

Date of Approved Plan:

Date of Plan Revision:

Is the notification flowchart complete and current?

Is inundation mapping or a description included?

Are emergency materials and equipment identified?

When was the plan last tested?

DOWNSTREAM HAZARD CLASSIFICATIONS

Present Hazard Classification:

Changes in Downstream Land Use and Habitation:

Is present classification appropriate?

OPERATION AND MAINTENANCE

Date of Operation and Maintenance Plan:

Are instructions adequate?

Do operating personnel follow instructions?

What are operating personnel capabilities?

EXAMINATION OF EMBANKMENT DAMS AND DIKES

DESCRIPTION OF STRUCTURE

Embankment Material:

Cutoff Type:

Impervious Core:

Internal Drainage System:

Movement (Horizontal and Vertical Alignment):

Junctions with Abutments or Embankments:

Miscellaneous:

CREST

Vertical Alignment:

Horizontal Alignment:

Surface Cracks:

Settlement:

Unusual Conditions:

UPSTREAM SLOPE

Slope (Estimate) (H:V):

Trees, Undesirable Growth or Debris, Animal Burrows:

Sloughing, Subsidence or Depressions:

Slope Protection:

Surface Cracks or Movement at Toe:

Unusual Conditions:

DOWNSTREAM SLOPE

Slope (Estimate) (H:V):

Trees, Undesirable Growth or Debris, Animal Burrows:

Sloughing, Subsidence or Depressions:

Surface Cracks or Movement at Toe:

Seepage:

External Drainage System (Ditches, Trenches, Blanket):

Condition Around Outlet Structure:

Unusual Conditions:

ABUTMENTS AND TOE AREA

Erosion at Contract:

Seepage or Wet Area Along Contract:

Signs of Movement:

Depressions, Sinkholes:

Unusual Conditions:

SEEPAGE AND TOE DRAIN / RELIEF WELL FLOW SUMMATION

Location	Estimated Flow	Color (Turbidity)

(Attach additional sheets for facilities with more than one embankment dam or dike)

EXAMINATION OF CONCRETE AND MASONRY DAMS

DESCRIPTION OF STRUCTURE

Type of Dam (Gravity, Arch, etc.):

Internal Drainage System:

Movement (Horizontal and Vertical Alignment):

Miscellaneous:

UPSTREAM FACE

Condition of Concrete or Masonry:

Cracking:

Location	Orientation	Length	Width	Type

DOWNSTREAM FACE

Condition of Concrete or Masonary:

Cracking:

Location	Orientation	Length	Width	Type

Leakage Through Dam (Location and Estimated Flow):

CREST

Condition of Concrete or Masonry:

Cracking

Location	Orientation	Length	Width	Type

Signs of Movement:

Differential Movement (Joint or Crack Separation or Offset):

GALLERIES

Cracking

Location	Orientation	Length	Width	Type

Differential Movement (Joint or Crack Separation):

Leakage into Galleries (Location and Estimated Flow):

Condition of Gallery Drains:

FOUNDATION

Condition of Rock or Concrete Lining:

Cracking:

Signs of Movement:

Seepage (Location and Estimated Flow):

ABUTMENTS AND TOE AREA

Seepage or Wet Areas:

Signs of Movement:

Cracking:

Erosion:

Unusual Conditions:

(Attach additional sheets for facilities with more than one concrete or masonry dam or dike)

EXAMINATION OF SPILLWAYS AND OUTLET WORKS

TYPE(S) AND DESCRIPTION OF SPILLWAY(S)

Primary:

Secondary (auxiliary):

Emergency:

Other:

FOR EACH SPILLWAY THE FOLLOWING ASPECTS MUST BE EXAMINED WHERE APPROPRIATE

ENTRANCE CHANNEL

Description:

Vegetation (Trees, Bushes):

Debris:

Channel Side-Slope Stability:

Slope Protection/Erosion:

Unusual Conditions:

SPILLWAY CREST

Description:

Condition of Material:

Signs of Movement:

Joints:

Unusual Conditions:

DROP BOX

Description:

Condition of Material:

Signs of Movement:

Joints:

Floor:

Unusual Conditions:

SPILLWAY WING WALLS

Description:

Condition of Material:

Signs of Movement:

Joints:

Drains:

Unusual Conditions:

DOWNSTREAM APRON

Description:

Condition of Material:

Signs of Movement:

Unusual Conditions:

CULVERTS

Description:

Condition of Material:

Joints:

Signs of Movement:

Seepage:

Location	Estimated Flow	Turbidity

Unusual Conditions:

TRASH RACKS

Description:

Condition of Material:

Unusual Conditions:

CHUTES

Description:

Condition of Material:

Signs of Movement:

Unusual Conditions:

STILLING BASIN

Description:

Condition of Material:

Signs of Movement:

Erosion:

Unusual Conditions:

EXIT CHANNEL

Vegetation (Trees, Bushes):

Debris:

Channel Side-Slope Stability:

Erosion:

Unusual Conditions:

LOW LEVEL OUTLET

Description:

Condition:

Trash Rack:

Leakage:

Location Estimated Flow

Unusual Conditions:

Was the low level outlet operated during the inspection?

Were there difficulties operating the low level outlet?

When was the low level outlet last operated and did this conform with the Operation and Maintenance procedures?

Miscellaneous:

STILLING BASIN FOR LOW LEVEL OUTLET

Description:

Condition of Material:

Signs of Movement:

Erosion:

Unusual Conditions:

EXIT CHANNEL FOR LOW LEVEL OUTLET

Description (Trees, Bushes):

Debris:

Channel Side-Slope Stability:

Slope Protection Erosion:

Unusual Conditions:

EXAMINATION OF OTHER FEATURES

INSTRUMENTATION (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.) location, condition:

(A separate report including instrument readings, condition of instruments, observations, and conclusions based upon the collected data should be attached.)

RESERVOIR

Slopes:

Sedimentation:

Unusual Conditions Which Affect Dam:

Unusual Conditions:

APPURTENANT STRUCTURES (Power House, Gatehouse, Penstocks, Water Supply, Other)

Description and Condition of each:

CONCLUSION

I certify that the above dam was personally inspected by me and was found to be in (**safe**, **unsafe**) condition.
Circle One

I recommend the following repairs be made immediately:

The following long term improvements should also be undertaken:

The following studies should also be undertaken:

Have the recommendations above included those from the Phase I Inspection Report or previous Regular or Formal Inspection Reports? If not, indicate why.

Does the Emergency Action Plan or the Operation and Maintenance Procedures require revisions?

Name of Professional Engineering Company/Consultant Representing the Owner:

Company/Consultant Address:

Company/Consultant Telephone Number:

New Jersey Licensed Professional Engineer representing the dam owner in responsible charge of the inspection:

Sign _____ Date _____

New Jersey Professional Engineer License Number_____
SEAL

(Department use only)
Dam Name_____
N.J. Reference No._____**Hazard Classification**_____
Engineer_____**Date of Inspection**_____